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ORIGINAL COMMUNICATIONS.

REVIEW OF THE PROGRESS IN HISTOLOGY.

BY DR. S. E. DAVENPORT, OF NEW YORK,

Chairman of Section 1.

[Read before the Connecticut Valley Dental Society, at Amherst, Mass., June, 1882.]

The chairman of Section 1 desires to thank *all* the members of the section for the very cordial support he has received, and particularly those who have taken any notice of his appeals for aid, even though it may have been with a "not prepared."

The dentist should have a good knowledge of general anatomy, and an accurate understanding of the arrangement of the tissues entering into the formation of, and lying contiguous to, the buccal cavity. In England the student of dentistry is required to pass as rigid an examination upon anatomy as is the student of medicine. In this country a full course of dissection has been made compulsory at many of our dental colleges, while at the excellent institutions of Harvard and the Dental Department of the University of Pennsylvania, the instruction and requirements are in every way the same, for the dental as for the medical students, in both anatomy and physiology.

In those dental colleges where a course of dissection is not obligatory, many students shrink from taking the same, partly from feelings of disgust and horror at the idea of spending so much time in close proximity to the cadavera. That feeling soon disappears upon the use of the scalpel, and the testimony of all who are really interested in anatomy will probably agree with that of the writer, in calling time at the dissecting table both profitably and pleasantly spent.

(The department of physiology was accepted by a member of the section, but his necessary absence from home for several weeks has prevented the preparation of his report.)

The idea that animals and plants, however complex their structure, are composed of a limited variety of elementary parts, has been held for many centuries. Aristotle referred to it in his writings, while Galen, the father of medical science, went so far as to claim that what we now call tissues, muscle, nerve, bone, cartilage, tendon, etc., were the ultimate elementary parts, or "*partes similares*," as he called them. It would seem strange that Galen, and the anatomists of his time, should claim that in the "*partes similares*" they had arrived at parts no longer analyzable, did we not appreciate the difficulties which beset the path of the histologist in those days in the absence of the compound microscope. To be sure, we know that simple lenses were known to the Greeks and Romans over twenty centuries ago, but their use was confined to the generation of heat by the refraction of the sun's rays, and to the magnifying possible with the simple lens, until, in 1590, the Jansens of Holland combined the power of two lenses and formed the first compound microscope.

The next attempt at the discovery of the ultimate physical element was made by Haller, who in the early part of the eighteenth century promulgated the fiber theory, claiming that all tissues were composed of fibres and an interconnecting organized concrete. In the early part of the present century there appeared the writings of a large number of observers who claimed the fiber of Haller was not the ultimate element, but that it could be separated into globules, which, they claimed, would form fibers, veins, arteries, etc., by the linear apposition and connection of these ultimate globular elements. All these writers agreed that there was a structureless, semi-fluid, glue-giving, intermediate material of which some tissues, notably cartilage, were for the most part composed.

The cell doctrine, as it is called, had for its founders the two eminent German histologists, Schleiden and Schwann, who in 1838–9

published their views—those of Schleiden being based upon his study of the minute structure of plants, and Schwann's upon the application of Schleiden's conclusions to the histology of the animal tissues. There cannot be too much credit given to Drs. Schleiden and Schwann for their patient labor with the microscope, for the cell theory, although incorrect in its claims as to the presence of cells distinct and separate—the unit upon which all development depends—was a great advance upon all the theories previously promulgated, and was so beautiful when explained and understood as to stamp each student who gave it attention an ardent admirer of histology forever. The writer confesses that he was much grieved when first it was demonstrated to him that the cell theory was not tenable. There was something so satisfactory in the idea of being built up of six or eight different kinds of cells, varying in shape according to the special needs of the locality, and the student imagined he could feel the blood pabulum coursing through his arteries, and when it reached the capillaries, there came the gentle though discernible grasp of the cell nucleolus, which metamorphosed the pabulum into living matter—soon losing its life, however—being changed gradually into nucleolus, cell contents, and then formed material—this last being just outside that ever present but never seen "cell wall," which has, in the much controversy regarding it, been likened to everything from the skin of an orange to the halo about Cupid's head.

Then, too, if it was ever our misfortune to meet with a person whose good nature was not sufficiently developed to enable him to bear all of our peculiarities, under the cell doctrine we could charitably conclude that in his organization the squamous and polar cells had unfortunately been transposed, or that when he was formed, the usual variety of cells not being obtainable, he had been obliged to close out a job lot of perhaps "*wandering*" cells. Now all is changed. No longer can we liken the human frame to a chimney, built up like it with cells for bricks, entirely separate and individual except for the mortar-like connection afforded by the intermediate formed material.

Let us hope that with the loss of our chimney all *smoke* has also vanished, and that the views held to-day by Carl Heitzmann and his disciples may prove as true through time as to the earnest student they now appear to be.

Carl Heitzmann was born in the year 1836 at the southern military boundary of Hungary, where his father was on duty as an army surgeon. Inheriting a strong liking for medicine and surgery, he studied these sci-

ences first in Pest, the capital of Hungary, and Vienna, Austria. In 1859 he graduated with honor at the University of Vienna, and was immediately elected assistant surgeon to the late eminent Prof. Schüh. In 1862 he became associated with the late Prof. Hebra, who soon published the greatest work on skin diseases in existence—six of the ten volumes being illustrated by Carl Heitzmann.

During the next five years Dr. Heitzmann pursued surgical, anatomical and histological studies, and illustrated and issued several works upon surgery and anatomy. His Manual of Surgery, two volumes, has reached five editions and is translated into several languages, while his Anatomy, also two volumes, containing 600 large wood cuts, has reached two editions. His first histological researches were published in 1868, and were upon the minute anatomy of the small intestine.

In 1872, '73 and '74 there appeared in the Transactions of the Imperial Academy of Science, in Vienna, various papers by Carl Heitzmann upon general histology, the new and peculiar claims of which, although scoffed at at the time by the originators and supporters of the cell theory, were destined soon to overthrow that theory and to make converts of many who at first were loudest in their jeering. Early in the year 1874 Dr. Heitzmann was elected Lecturer of Morbid Anatomy in the University of Vienna, where he was in the direct line of promotion to the Chair of Morbid Anatomy, to succeed the late Rokitansky, but on account of the new views upon histology held by him, and the jealousies of his fellow-workers, another man was elected to the professorship, Carl Heitzmann was disappointed, and with a desire for surroundings less oppressive, and with less deep ruts in which he was expected to run, came to New York toward the end of the year 1874 and established his laboratory.

It may be stated here that Carl Heitzmann made most of his discoveries while working in the laboratory of Stricker, Professor of General Pathology in the University of Vienna, and had not Stricker worked against him and refused to accept his discoveries as true, Heitzmann would have had the professorship he wanted. However, in 1880, Stricker published the results of researches of his own, principally regarding the cornea, and accepted fully Heitzmann's claims of six years previous. The English physiologist, Drysdale, in 1865, compared the cell to a gun barrel without lock or stock—so imperfect did the theory seem to him, and this was after Lionel Beale and Max Schultze had established their protoplasma theory, which they tried to conform to the cell theory. Heitzmann felt the same dissatisfaction

with the so-called cell doctrine, though with greater force, and resolved to prove it if true or to *dis*prove it if it was, as he thought, false.

Upon Schwann's investigation of the constitution of cartilage, his cell doctrine was to a great extent based. Heitzmann's bioplasson doctrine was formed from what he saw in his examinations of the same tissue, though it would seem to be the least suited of all tissues for the demonstration of his peculiar claims, on account of the large proportion of basis substance. Heitzmann found the formerly supposed non-connecting cartilage cells to be masses of living matter, the nuclei and granules of which were connected by fine lines of a protoplasmic nature, making a network within the corpuscle, and that each corpuscle was connected with all others in the vicinity by means of—to use the appropriate term suggested by Prof. L. Elsberg of New York—a bioplasson reticulum, which pierced the glue-yielding basis-substance in all directions. Dr. Heitzmann has demonstrated that the formerly so-called protoplasm of tissues in general is not, as was supposed, structureless, but that it has a reticular structure—the reticulum being the living matter proper, on the contraction and extension of which depends the change of shape and the locomotion in the simplest animal organism, the amœba, as in the highest organs of man. Not only is there a connection by means of the reticulum between all portions of living matter in the same tissue, but the bioplasson of each tissue is intimately connected, by fine off-shoots, with that of the tissue lying contiguous to it. This body of ours, then, in place of being made up of colonies of structureless amœba, as claimed by Hæckel and Huxley, may be said to resemble an enormous amœba, with a bioplasson reticulum absolutely and literally connected throughout, enclosing in its meshes a lifeless fluid, while the meshes of the accompanying basis-substance enclose a glue-giving material, which is the lifeless fluid above referred to, chemically changed and solidified. Isolated lumps of living matter are found only suspended in the liquids, blood and lymph, and in the different secretions.

Two years ago A. Spine, of Vienna, treating cartilage with alcohol, discovered a ready and simple means for demonstrating the connection of the cartilage corpuscles — so simple, indeed, that to-day an eye little experienced, and with comparatively low power, can see what in 1873 Carl Heitzmann maintained, based upon rather tedious methods of staining the cartilage with nitrate of silver and chloride of gold. Carl Heitzmann's laboratory comprises the entire fourth floor of his residence and is a convenient and well-lighted apartment. The

number of work tables, at first four, is now seventeen, this large increase having been necessitated by the rapid filling up of the classes, over 700 gentlemen having studied there since the laboratory was established.

The study of the minute anatomy of the teeth has made remarkable progress during the last four years, and principally through the efforts of Carl Heitzmann and a few co-workers, among whom is Dr. C. F. W. Bödecker of New York, who has contributed the most knowledge to the departments included in this section. It may be well to refer briefly to a few of the most important discoveries by Dr. Bödecker and others concerning the structure and relative arrangement of the organic and inorganic constituents of the dental organs—based, all of them, as far as possible, upon C. Heitzmann's bioplasson doctrine.

Much advantage was gained by these gentlemen in not confining their examinations to specimens cut from the dried tooth—it being easily seen that in the process of drying, the soft tissues would shrink, lose their form and occupy much less space than during life. Then, too, dried specimens have to be ground; consequently, the spaces (lacunæ, tubuli, etc.) would collect more or less dirt, which would confuse the examiner, dirt not always having its name upon its face so that it may be recognized as such. Fresh specimens were cut with the razor from teeth which had been immersed in a one-half to one per cent. solution of chromic acid.

It is not necessary to go into the late methods of preparing specimens, which are many—all tending toward the preservation of the form and natural position of the soft tissues and the prevention of the accumulation of foreign substances. The dentinal tubuli radiate from the boundary of the pulp canal, differing in curvature according as they are directed toward crown, neck or root of the tooth. Each tubule or canaliculus runs in a wavy course, branching usually only as it approaches enamel or cementum, and contains a slightly beaded fibre which is smaller than the calibre of the canaliculus. From the periphery of these fibres fine off-shoots may be seen, with high power, which point toward corresponding openings in the walls of the canaliculi, though they are often so fine as to prevent the examiner from really seeing their exit through these little openings; but in stained specimens a fine reticulum of bioplasson can plainly be seen piercing the basis-substance between the canaliculi, and its connection with the dentinal fibres is shown at many if not all points. The canaliculi and their contents branch and ramify in an exaggerated manner as they

approach the enamel and cementum, the increased sensitiveness of dentine at these points during dental operations being accounted for by the presence of a larger proportion of living matter. The dentinal fibres are connected with the odontoblasts of the pulp in the growing tooth and with its protoplasmic bodies in the adult tooth, no regular odontoblasts being present. The periphery of the dentine next the cementum does not contain canaliculi, a finely granular layer varying in thickness being found here, the bay-like excavations seen at the juncture of dentine and cementum often containing protoplasmic bodies possessing off-shoots which serve to connect the branches of the dentinal fibres with those of the cement corpuscles. This layer of protoplasmic bodies between dentine and cementum, as also between dentine and enamel, has been named by Dr. W. H. Atkinson the interzonal layer.

The connection of the dentinal fibres with the cement corpuscles is also established by the anastomosis of the fibres, or their large branches, with the coarser off-shoots from the protoplasmic bodies of the cementum, and by the fine reticulum of the basis-substance of the dentine passing into that of the cementum. This is the only method of connection at the neck of the tooth, the dentinal reticulum starting from small pear-shaped enlargements on the terminations of the fibres.

The connection can also be seen between the living matter of the cementum and the nucleated protoplasmic bodies of the pericementum, excepting at the neck of the tooth, where the cementum is covered by epithelial elements which turn over into the epithelial coating of the gum, and closely resembling those comprising the so-called Nasmyth's membrane which covers the enamel of the young tooth.

Tomes describes the human enamel as a structure containing but 3.5 per cent. of organic matter, the remaining 96.5 per cent. being lime-salts. He tells us of the enamel rods, has much to say about their shape, their wavy course, etc., and then adds: "The rods are solid, are in absolute contact with one another and have no demonstrable intervening or uniting substance."

Dr. Bödecker also admits the existence of the enamel rods and agrees with Tomes in regard to their course, etc., but he sees and demonstrates to others the existence of what he calls "enamel fibers" of living matter in the interstices between the rods. Branching from these fibers at right angles with them there may be seen minute conical fibrillæ which traverse the space between the fibres and the contiguous

rods, enter the rods and are then lost to view, though in the thoroughly decalcified specimens these fibrillæ may be seen traversing the substance of the rods proper, and uniting to form a network similar to the reticulum in the basis-substance of the dentine. Tomes informs us of the existence of organic matter in enamel, but does not tell us in what form or at what points it may be found. Bödecker not only gives us full information in regard to the position of the organic matter, but he prepares specimens and adjusts them so that the novice can see this fine reticulum in the enamel rods.

Dr. Bödecker has also demonstrated the morbid changes which take place in the formation of secondary dentine and in inflammation of the peri-cementum and pulp—all of which has been written up in the able manner characteristic of him, and published in the Cosmos.

Dr. Frank Abbott has spent much time in the examination of tooth caries, and, though the subject is too formidable to be mastered by the researches of one man, he has certainly added much to our knowledge of that pathological condition. He is at present pursuing studies concerning the changes of the dental tissues during the process of absorption of the teeth of the first dentition.

A very valuable book, and one which we will all want, is soon to be issued from a New York press. It is from the pen of Dr. Heitzmann, is upon general histology and microscopy, and its title is "Microscopic Morphology." It will contain a complete explanation of Dr. Heitzmann's views as well as the researches of a number of his co-workers, including Dr. L. Elsberg of New York, and it will not only be a very interesting work but the most valuable one for the advancement of science which has been published for years.

Every dentist present should take the first opportunity of meeting Dr. Heitzmann. He is a large-hearted, genial gentleman, very courteous, and, of course, very enthusiastic upon the subject of microscopy. His aim is, he says, to raise the standard of dentists in this country in their strictly scientific attainments, and I am sure he has already done much for the profession in that direction.

His views, although nearly revolutionary in comparison with those held by previous histologists, are not like a sieve—they will hold water—and I defy the greatest unbeliever not to be converted to the bioplasson doctrine after looking at Dr. Heitzmann's specimens through the microscope and listening to one short course of his lectures.

This report cannot close without referring to the great friendship existing between Dr. Heitzmann and our own dear Dr. Atkinson, or

"Papa," as Dr. Heitzmann delights to call him. When Carl Heitzmann first came to this country, Dr. Atkinson, becoming convinced of the truth of the bioplasson doctrine, did much to introduce him, and assisted in making the laboratory the success which it soon became; and to the cordial support given by Drs. Atkinson, Mills, Bödecker, Abbott, and a few other prominent dentists, to Dr. Heitzmann's views, is due his great interest in the profession at large, and his desire to add to our knowledge of the departments of Section 1.

A BRIEF DESCRIPTION OF THE MICROSCOPE STAND.

BY DR. A. M. ROSS, CHICOPEE, MASS.

[Read before the Connecticut Valley Dental Society, at Amherst, Mass., June, 1882.]

Some apology is due the gentlemen present, for presenting this paper, who are perfectly familiar with the subject, and as such an apology I will explain that it has been thought proper to commence at the very beginning, and describe the instrument that is necessary in the study of histology, that is, explain to those who desire to know the best instrument, reasonable in cost, that may be procured of dealers in microscopes. I have not known how to prepare such a paper and make it interesting to all alike, but I believe that the advice I have gathered from such authorities as Drs. Carpenter, Seiler, Frey, Phinn, and from personal friends who are experts in certain branches of microscopy, will be of value to any one who wishes to buy a stand.

I will briefly refer to what the microscope consists of: There are two kinds of microscope—the simple and the compound. The simple form consists of a single lens of one piece of glass, or one lens of two pieces of glass cemented together with Canada balsam, this lens having a certain working or focal distance from the object. The compound instrument—the subject of this paper—in its simplest form is composed of two lenses, the object lens and the eye lens, supported in a brass or other metal tube.

The difference between the simple and the compound instrument consists chiefly in this: With the simple microscope, the object is looked directly at, which may be more or less magnified; with the compound instrument, the object is more or less magnified by the object glass, but the image that is produced by the objective is inverted; the image thus formed is further enlarged by the eye-piece, so that

the image of the object as thrown upon the retina is reversed. There are many different patterns of stands, but of late years there is but one model that is much patterned after. It is known as the Jackson model, and is without doubt the best model for a microscope ever designed. In describing the several parts of the stand, this fact will be apparent.

The foot of the microscope demands the first attention, it being the foundation upon which the rest of the instrument is supported; it is one of the most important parts. The low, broad, tripod form of foot, so constructed that the body of the stand at any angle of inclination will be held firmly, is the best form. Upon such a foot, the tube supporting the optical parts will not vibrate.

It is believed that any stand the tube of which cannot be inclined, would be rejected by any sensible person—unless, perhaps, by those having extraordinary good backs—because unfit for protracted work.

Usually, between the foot and the body, there is a single pillar, or two pillars, on which the body is hinged at its center of suspension. That part of the body attached to the pillars is called the arm, and in the Jackson model this arm is a solid piece of metal. It is the belief of my friends, and my own, from considerable experience with different styles of microscopes, that the greatest steadiness is secured when the arm is swung between two pillars on trunion joints, though a low, heavy single pillar with cradle joint gives very great steadiness to the body.

The arm is so constructed in this model that the main tube, which rests upon it, is supported by the arm a considerable part of its length. The value of this feature in contributing to solidity is at once understood. The rapid movement of the tube is made by slide, or rack and pinion, or by chain and wheel. Some instruments are made so that the coarse adjustment may be made either by sliding the tube, or rack and pinion, at will. The properly made rack and pinion is the best, and it is the most generally preferred if it works freely, smoothly and noiselessly. There should be no loss of motion, and the object in the field of vision should not move when operating the milled head of the pinion; for, if it does, the workmanship is poor, or the design of the stand is upon a poor plan. If this coarse adjustment is first-class, medium power objectives may be readily focussed by it.

The stand should be furnished with an excellent, fine adjustment, and it should operate the whole body. The most convenient place for this adjustment is at the top of the arm, under the tube. Some mi-

croscopists prefer the fine adjustment located on the end of the main tube, near the objective, and it is practically just as well there; but theoretically it is not correct, because there is caused a slight alteration in the length of the tube and optical parts.

The main tube should contain a draw-tube, so that with the glasses in position the length of the whole may be regulated to ten inches. Some stands have the draw-tube provided with a stop, which is very convenient in obtaining the regulation length—making it unnecessary to measure the tube at each change of glasses.

The ends of the main tube and of the draw-tube have apertures and threads of standard size, known as the "Society Screw." Some stands are provided with a mechanical stage; such provision is always expensive, and except for special purposes, they are not valuable. A stage perfectly plain, with clips to hold slides, or, better still, a plain stage furnished with a carrier, is better for ordinary purposes than one having mechanical movement.

The stage may be rectangular or circular in form. A stage made of heavy plate glass, rectangular in form, set in a metal frame to give additional strength, is an excellent style; a circular stage, that may be revolved, is very good for some kinds of investigation, and when provided with a glass stage and carrier, to be slipped on over the other, nothing better could be wished for.

Beneath the stage is the sub-stage, which is quite useful in various ways. It usually carries the diaphragm plate, that has apertures of different sizes for reducing the light directly transmitted to the object, or reflected from the mirror. It carries the condenser of light to transparent objects; the polarizer of the polariscope; the different kinds of illuminators, etc. The sub-stage on the cheaper stands is fixed to the under surface of the stage, but it is best when attached to an independent bar or the mirror, because the light condenser can be easily and more accurately focussed if its carrier is on a bar, than when the adjustment has to be made in the sub-stage itself.

A great many people prefer a binocular instrument to a monocular, because they like stereoscopic vision of the object; but stereoscopic vision is only possible with low-power objectives, and when the higher powers are in use, the binocular is converted into a monocular by cutting off the prism at the junction of the two tubes. The binocular is the more expensive of the two, and there is no practical gain. Both eyes should be kept open in using any microscope, and then there is no strain or injury to the eyes. This is accomplished easily by buy-

ing or making an eye-shade that will fit the outside of the upper end of the tube, one end of the shade extending either to the right or left eye, at will, and bringing before the unused eye a broad, opaque surface.

I have herein outlined all the salient points composing a good microscope, and not a large outlay in money is necessary to procure a stand having these points, and more too.

One thing more should be remembered. It is conceded by most all familiar with the microscope, that the day of the very large, heavy, expensive instruments is past. The smaller, more compact and lighter stand, with its parts accurately proportioned, is in great demand now, and that demand is increasing constantly. The large stands referred to have their special aptness; outside of that field of usefulness, they are great, cumbersome pieces of furniture. This paper has been devoted to the dry details of that part of the compound microscope aside from its optical parts, and the most interesting and important part of the subject is left for a possible future consideration.

SOCIETIES.

Meeting of the Connecticut Valley Dental Association, At Amherst, Mass., June 29, 1882.

AFTERNOON SESSION.

Dr. Cutting, of Barre, is elected member of the Society.

Next subject: Report of Section 5.

Dr. PARKER *On Base-Metals:* About two years ago a clergyman of some seventy years of age came to me to have teeth extracted, and a plate inserted. There were about twenty teeth in his mouth. I extracted them, and about two months afterward put in a rubber plate. In one year and one-half from that time he came to me with softening of the gums, which had amounted to considerable. They were spongy to quite an extent and, on the whole, it was quite a discouraging look. He thought he would have to resort to a gold plate, and that this would remedy the influence of the rubber plate. It was about at the time of the meeting at Springfield last year. Through the kindness of Dr. Atkinson I had made plates with Reese's metal;

I put the teeth on the model, about the same as for rubber, and sent them to him to cast them into Reese's base-metal. It was returned to me completed, and three months after they were inserted in the mouth the gums were very much improved, the softening was somewhat, and the inflamed condition of the gums was much improved. I have seen the gentleman several times since; each time there is an improvement in the gums; the plates are very heavy on account of the fullness I had to give, and not being experienced, I made them too thick. The plates would weigh as much as three or four sets of rubber, but the gentleman did not mind anything about this. They were nicely adapted, and where there had been injury of the gums or where the plates had been too high or low, it had not made that angry sore which rubber does usually produce; slight scraping or paring would remove the trouble, and the gums now have nearly normal hardness and density. The gentleman, of course, is perfectly satisfied, and so am I. I feel that it is something that will prove successful. If persons of twenty years commence to use rubber plates, the absorption of the gums, when they grow older, must be frightful, and I think by plates of this metal we may greatly prevent this evil. I do not advertise this metal, but I think it is what we need.

Dr. STRANG: I would like to inquire if the upper plate was made without air-chambers?

Dr. PARKER: It was.

Dr. SEARLE: What is the expense of this plate, as compared with rubber?

Dr. PARKER: Dr. Atkinson can better answer, as he has, up to the present, supplied us with these plates. I put this plate at the same price as rubber, because of the special circumstances of the gentleman.

Dr. SEARLE: But that you cannot do ordinarily. What would you ordinarily charge? About twice as much as for rubber?

Dr. PARKER: About $25 would be a fair price, comparing with $15 for a rubber plate.

Dr. SHEPARD: I present a regulating case with the models before and after treatment, and the plates used. The patient, aged 17, fitting for college at Exeter, N. H., came to me in April, 1881. He had the right upper central incisor knocked out, when a boy, by the kick of a horse. You will notice that the left central and right lateral are in contact, the original space between them being obliterated, and that the upper molars and bicuspids strike inside the lower—in a word, that the upper jaw is contracted. Dentists who saw the case previous

to his coming to me, advised the extraction of two lower teeth, so as to make the lower jaw smaller, to correspond with the upper. I judged that such treatment would be very improper, and that the upper jaw should be so expanded as to restore it to its original size, and then to supply an artificial right central in place of the one lost. A main argument in favor of this course was that the contour of the face would be improved, and its intended character restored. My first effort was to move out the molars and bicuspids, doing nothing to the front teeth. Soon after this was commenced, and little progress was made, he wished to go home to Illinois for his summer vacation, and I made for him to wear during the whole summer this plate. It is made of vulcanite, filling the roof of the mouth ; there are two gold springs or levers attached to the back of the plate—one to press against the right canine, the other against the left lateral. You will notice that the right lateral and left central had no pressure against them, as they would be pressed out rather than back by such pressure. The plate could be easily removed for cleaning. When he inserts it, he has simply to spring the levers together and press into the mouth. The next model shows the condition on his return in the fall. The constant gentle pressure upon the cuspid and lateral has not only moved them, but by their contact with the posterior teeth, the bicuspids and molars are so changed in position that the occlusion with the lower teeth is all that is required. There is, you see, a space between the moved right cuspid and the right lateral, and another space between the left central and the moved left lateral. The right lateral and left central were still touching at their cutting angles, with the V-shape space between, as at first. I then showed him how to model wedges of wood to wear between these two teeth. In a few weeks he had these teeth forced back to their proper positions, closing the spaces on either side, spoken of before—the space between them being of the size of the lost right central. I now made a suction gold plate with a porcelain tooth, which at the same time supplies the vacancy and acts as a stay-plate. The teeth occlude perfectly, and the face is restored to its proper contour. The main point, which is, I think, original and new, first presented to the profession, is the manner in which my springs or levers may easily be fixed in a vulcanite plate so as to be removed for bending or for the substitution of a new spring without having to make over the plate. The spring is fixed in a socket or bush, which is made by taking the spring itself, or a wire of the same size, and making the socket end either square or triangu-

lar; then wrap around it tin foil of good thickness, and about this wind binding wire; the spring or wire with its surrounding tin foil, etc., is pressed, in the proper position, into the gutta-percha trial plate, as you would a spring which you were to vulcanize in, and then invested as usual and vulcanized—the wire serving as a core to prevent the socket collapsing under the pressure during vulcanization. When the plate is vulcanized, you have simply to withdraw the wire, leaving firmly impacted in the vulcanite plate the tin foil and binding wire, making a socket or bush in the plate in which to place the spring or lever which you are to use in the mouth. This spring may be fastened in by gutta-percha or shellac, or even a fiber of waxed silk; but if you have a tight fit, nothing is necessary, any tendency to turn being prevented by the square or triangular shape of the socket. For springs I now use generally the spring steel wire known as "piano wire," the invention of Dr. Coffin of London. For the second point of interest, I ask you to notice how sharp and definite these models are which show the occlusion of the teeth, or the labial and buccal aspect of the teeth, when closed. A common way to take such impressions is to let the patient bite into a mass of wax or impression compound, and then mould it carefully about the teeth. The chief difficulty in getting accurate models this way is that you are not sure the teeth are tightly closed or in exactly the proper position. To get such models I have had made special cups, unlike any in the market. You can make them easily of any plate, such as German silver or white metal; cut the plate into strips of one-half to three-quarters inch in width, of suitable length; bend these into proper curves and solder on handles, which also will serve as stiffeners, or you may make more stiff by doubling the plate. To use this cup, heat your impression material and place it in the cup; have the patient close the teeth tightly and hold so; then, passing the cup inside the lips and cheeks, make *gentle* pressure, *very slowly*, and the impression material will conform to all the irregularities of surface and even press between the teeth and up into the space between the upper and lower incisors. When cold, let the patient open the mouth, and then remove the impression. You can in this way get perfect models of the outside of the closed teeth, even including the molars.

Dr. STRANG: I would like to ask Dr. Shepard if he had any trouble in using black rubber?

Dr. SHEPARD: Not more than with the other. I do not remember having seen any porous rubber.

Dr. STRANG: I am very well acquainted with a gentleman who had considerable experience, and had experimented considerably with black rubber, and he tells me that there is no rule by which he can be assured that the black rubber plate will come out perfectly. He has experimented considerably with it.

Dr. DAVENPORT: I never had a porous case. I take about one-half hour getting up to the point of vulcanization. I run it to about 315° F.

Dr. MORGAN: I think that the coating of the mouth is easier removed from black rubber than from red. I do not believe in rubber generally, but I prefer black rubber to red because of its greater strength and density. It has about ten per cent. more rubber than the red; I treat it like red rubber, and I cannot say that I have had any porous plates; I run up to about 360° or 370°. The plate may be a little more brittle, but it is strong and dense.

Dr. SEARLE: Do you vulcanize the same length of time?

Dr. DAVENPORT: Yes.

SECTION III.

Dr. E. S. NILES, chairman of the section, reports:

The organization of the sections, their plan, etc., have been rather indefinite to me. Having had no consultation with members of section 3, I have sent notes to quite a number of members asking them to write something for us, but have received no encouraging replies. What I have to say, as chairman of the section, will be upon three subjects: amalgam, gold, dead teeth.

Amalgams: A great deal has been said about amalgams, and I think it has resulted in good. I think at present we have better amalgams than ever before, and it is due to the exclusion of metals which are inert. The best amalgams that we have are made of inoxydizable metals; we have the tin, silver and gold amalgam. Gold does not oxydize at all in the mouth. The only metal which oxydizes, or rather sulphurizes freely, is silver. Silver is injurious in amalgams because it sulphurizes so easily by the action of sulphuretted hydrogen. If we could get rid of the silver and use other metals that do not sulphurize so easily, it would be a great improvement; tin and mercury, as used on the back of mirrors, very seldom tarnishes. Silver gives to amalgam strength and hardness—the more silver the harder the amalgams. Gold, silver and tin are the best metals now in use, and the less silver the better. We know how the old Lawrence amalgam oxydizes and sulphurizes, because it contains silver, copper and platinum, which latter, by the way, is inert.

The subject of *Gold Plates* in the mouth is an interesting one for discussion. Possibly the older dentists can speak better on it, from their great experience, than I from my knowledge. The gold for dental plates is alloyed with copper and silver; both metals tarnish. I have used the alloy which Hood and Reynolds sell, and that which White prepares, and in every case I think the plate has tarnished more or less; to obviate this, it occurred to me if we could use platinum in quantity just enough to stiffen the gold, we would get a plate which would not tarnish, because neither of the metals tarnish. (A piece of this alloy is shown). It seems to me to be a great improvement. I use this preparation in my practice.

Dead Teeth have been a source of annoyance since I commenced the practice of dentistry, but the difficulty I have experienced is, I believe, to a great extent due to an imperfect understanding of the trouble in hand. I must confess to have associated the exciting cause of abscessed teeth with the apex of the root at the point where the so-called secreting sac or abscess is attached, and, in my treatment, the main point has been its entire removal, and the disinfecting of the root preparatory to filling, and I believe, so far as one may judge from the various processes recommended for the treatment of dead abscessed teeth, such as drilling through the canal or the alveolar to the apex. Treating with chloride of zinc, carbolic acid, creasote, and aromatic sulphuric acid—all these, it seems to me, point to a misunderstanding of the part to be treated, and that the result to be attained very largely, if not wholly, depends upon the entire removal of sac and fistula first, then of course the tooth to be cleansed and filled. At a recent meeting of the Harvard Odontological Society, Dr. Whitten, of South Boston, reported the successful treatment of forty cases of dead teeth by simply washing out the canal with warm water for several days, then drying the substance of the tooth with cotton and the hot-air syringe, saturating it again with alcohol and filling with gutta-percha. After some study of the subject, I have come to the conclusion that this is the most scientific treatment I have known to be adopted, for when we look at the condition of things carefully, we find that really the only dead and offending thing is the tooth. Remove that, and ninety-nine cases out of one hundred that locality becomes healthy and normal; but, if the tooth is to remain with normal surroundings, it must be rendered clean and free from decaying organic matter, which constantly poisons the soft surrounding tissue. The exciting cause, then, after

the death of the pulp, is the continued decomposition of the organic substance in or of the tubuli and dentine. The gases and decomposed matter not finding a ready outlet through the crown, force their way through the canal to the apex, and ultimately by a fistulous opening to the surface. This dead product is poisonous to the tissue, and nature protects the more distant parts by forming a thick connective tissue wall first at the outlet in the root, and finally along and around the whole course of the canal. We have, then, the abscess originally and primarily confined within the tooth limited to pulp-chamber and canals, but the so-called *secreting sac and fistula* are only the abscess tracks formed to convey away matter from the tooth. No doubt this canal or "fistula," through its entire length, contributes largely to the product that appears at the outer orifice, but this is due to the action of the gases or matter upon the connective tissue walls, as they traverse the track away from the tooth. We will not, however, forget that this condition of things may have existed for perhaps many years, and until nature fails to protect the more distant parts, then a secondary exciting cause may exist; but I believe these cases are exceptional and rare, as the most severe cases are cured by the removal of the abscessed tooth. Basing my treatment upon this view of the trouble, my efforts are mainly directed to the pulp-chamber and canals, getting the best opening to these parts possible, drying and cleansing freely with the various disinfectants and antiseptics, and when this is done, thoroughly dry, as Dr. Whitten recommended, finally sealing with the well-known solution of gutta-percha and chloroform, and filling with gutta-percha. The abscess track may be left alone, and if the work has been done thorough, there will be no further use for it, and its absorption will be a matter of a few days or a week. We often meet with crooked roots; in such cases, in my judgment, it is not bad practice to extract and treat in the way already described, but if necessary to excise any portion of the root or expose the cement or dentine, it should be carefully covered with gutta-percha. Replace the tooth before inflammation in the socket sets in, and fasten, if necessary, as judgment and the case may direct.

Prof. CHAS. MAYR: If it might not seem immodest, I would like to give my opinion about the odor in those cavities and abscesses of teeth containing ichor or sanious pus. I do not suppose that so much of it is due to sulphuretted hydrogen SH_2 as to other sulphur-and-oxygen compounds. The odor of sanious pus is so much more offensive

than that of SH_2 that I presume it is to a large extent due to aldehyde-acids and sulpho-compounds of organic and complex nature. Of course SH_2 may be present, too, but the offensiveness of the odor is due to different substances. All those who have to work with SH_2 get used to it; it does not smell very bad, after all. I suppose that the odoriferous principles of ichor, etc., is due to the presence of the same substances which produce foul breath, foul alvine, and stomachic exhalations, etc. These substances have been but little investigated, but we can produce them artificially by an interesting process. If we heat caustic potash with a little bread, butter, meat, etc., to a certain point, dissolve the resulting mass in water and add an excess of dilute sulphuric acid, we obtain an evolution of gases, presenting strikingly the odor of alvine exhalations and foul breath, after the ingestion of the above articles of food. This fact was discovered by Prof. J. v. Liebig, and I myself saw the experiment performed by him. It will give us some clue as to the nature of these smelling substances. By melting thus substances with caustic soda, we obtain acids which are capable of higher oxydization—acids which contain aldehyde-groups in their constitutional formula; the oxygen to transform meat, etc., into these imperfectly oxydized acids, is derived from the air in which we melt the substances. If we add afterwards sulphuric acid to the mass, these acids are probably set free, and we get their respective odors. I, therefore, consider this odor due to the formation of such or similar compounds by the imperfect supply of oxygen from the blood; a perfect and properly arranged supply of oxygen oxydizes them higher, and thereby they become different substances with less offensive odor.

Dr. NILES: But is not there hyperaemia around an abscess, and therefore an excess of blood?

Prof. MAYR: Yes, but passive, venous hyperaemia with deficiency of oxygen; some oxygen is supplied, but not enough, and the products accumulate.

Dr. SHEPARD describes a case of peculiar abrasion on almost all teeth after a violent typhoid fever in a young patient. The diseased soft mass was ground off and the spots polished; no recurrence of the decay followed.

Dr. NILES: Do you recommend the use of tannic acid?

Dr. SHEPARD: I recommend it.

Dr. NOBLE: In what form do you use the tannic acid?

Dr. SHEPARD: In the form of powder given to the patient to make the proper solution himself.

Dr. PARKER: Do you account for the effect on the teeth by the action of acids?

Dr. SHEPARD: I am not prepared to say so. It is possible that the history of the case might lead to the conclusion that it is the result of the rather super-abundant mucus or deficient saliva, or undiluted mucus, which is the same thing. The softening of extensive surfaces of the tooth would lead one to say it might have been from a solvent alkaline. I do not pretend to be enough of a chemist to answer these things.

The question is asked if the spots were soft.

Dr. SHEPARD: Not soft but friable, a little brittle; you could scrape them off with an instrument; it could be ground, but it did not scale off.

Dr. NOBLE: Have we not all seen this state of affairs? If I understand rightly, have we not seen it often as the result of simple neglect? I have seen a large percentage of the six year molars in the mouths of children presenting the same state of things.

Dr. ATKINSON: This is a very interesting case, and I am not impressed with its being rare. It is not the result of imperfect organization, because the lines of decay do not follow the lines of tooth development; it is a local action, not by reason of the lack of nutrient power, but something actually has worked on it. One or two suggestions: workers in bromine factories are liable to certain diseases of the cartilage of the nose; they have a twitching and itching, but the whole sometimes passes without any sensation; a waste of tissue takes place and the septum is perforated; a very high percentage of those engaged in the work suffer in this manner. May be that this may wake up some time inquiries in this direction; at least, what we have had of knowledge does not account for this state of things.

Dr. STRANG: About eight years ago I had to do some operations for a lady; she was 45 or 46 years old, and had a beautiful set of teeth; every tooth was like a pearl. She was taken violently ill and became insane; was under treatment from four to six months. Perhaps three or four months afterward she came into my office again, and upon examination of her teeth, I was amazed to see what a change had come over those beautiful teeth; every tooth had the surface of an oyster shell; the lady had used a great deal of bromides of potassium. I polished her teeth as perfectly as I could, and left deep grooves in the incisors. It is now eight years, and her teeth are still as beautifully polished as on the day they were polished; no de-

cay about them. I attribute the change in the teeth to the action of bromides of potassium.

Dr. SEARLE: The tincture of muriate of iron is often given, and I have seen beautiful polished teeth in six months become rugged, and it is possible that there are other medicines which have similar effects on the teeth.

Dr. PARKER: The last remark suggested an experience in my own mouth. I was troubled with very severe sore throat, and my physician gave me a gargle; one ingredient was muriatic acid and, after using it some time, I observed that my teeth were quite dark; I got my brush and gave them a thorough brushing; they were not smooth, but rough and chalky. I did nothing further but polish with pumice stone and brushes, and I suffered nothing afterwards.

Prof. MAYR: About the reference of Dr. Atkinson to bromides and working men in bromine factories, is there not somewhere a mistake? The very identical symptoms were described, and the notice about it I saw in many papers, but the producing agent was not bromide of potassium, but bichromate of potassium; where is the mistake? I am quite sure that the special symptom of perforation of the septum was ascribed to bichromate of potassium. Another point mentioned by Dr. Parker, I think, is that the teeth, after the action of acid, present a chalky appearance. Now, chalk is carbonate of lime; therefore, a chalky appearance would mean an appearance of carbonate of lime; this is not very well possible, since the acid would have taken out the lime; if the acid takes out the lime-salts, the tooth will have not a chalky but a gristly appearance; but if something else has been taken out, the appearance of the lime-salts may be *chalky*.

Dr. NILES: In typhoid fever you will know we have increased temperature; the great mucous membrane of the mouth becomes very dry. Magitot observed increased acidity of the saliva from the fermentation of the mucus by the rise of the temperature; the acids are lactic and acetic acids, both of which dissolve the teeth. This young man spoken of by Dr. Shepard in his paper went through a severe disease; he was taken sick in summer; when the system has obtained vigor, he shows still the consequences. This reminds me of a lady who had a great many children, and, while carrying a child, her system was subject to a great drain of lime-salts; her teeth had this appearance: Chalky in some places; in others, where the salts were more dissolved out, they could be cut with an instrument; she recovered after the delivery of the child; the places of decay have returned to their hard

condition, although discolored in some places. I believe the teeth are in better condition from the use of alkaline washes to neutralize acids; I have not ground out anything. These alkaline washes are in perfect conformity with the best authorities of the time. As to the use of tannic acid, I wish to say that I consider it as fuel to the fire; it has an action upon tooth substance; if you put a tooth in a solution of one per cent. and leave it there for three months, it is decalcified.

Dr. SHEPARD: I would like to ask Dr. Niles where the lime-salts come to recalcify the surface.

Dr. NILES: There is plenty of opportunity to recalcify; at the age of the boy the tooth was not yet perfectly calcified; a good deal of calcification is still going on. How old was he?

Dr. SHEPARD: Seventeen years.

Dr. NILES: What good came from the use of tannic acid?

Dr. SHEPARD: I stated that I doubted if any came, but I think it is a different thing, using a solution of tannic acid and putting a tooth into a strong solution.

EVENING SESSION.

This session was devoted to Section No. 1, Dr. S. E. Davenport, chairman.

Papers were read by Drs. Ross and Davenport—found elsewhere in this number of the Journal.

Discussion:

Dr. ANDREWS: My own work has been in the line of investigation of the development of teeth. I have specimens which show the development from the enamel organ to the full tooth.

Dr. NILES: I should like to inquire what the advance was which Dr. Bödecker has made in bringing out the organism of the nervous mechanism in teeth.

Dr. DAVENPORT: I should say that the greatest advance made by Dr. Bödecker in regard to the organized structure of the tooth has been the connection of the dental fibrils by means of fine offshoots from the periphery of the dentine and the formation through their anastomoses of a reticulum in the substance between the canaliculi or the base-substance; he showed the living matter in the enamel and the net-work connecting it. I do not think that he claims that these fibres are nerve filaments or even are the extension of nerve filaments. He claims simply that they are in connection with the nerve of the

pulp and are capable of conveying sensation, perhaps as well as if they were nerve fibres.

Dr. NILES: He claims that they receive with chloride of gold the same color as nerve fibres, and are stained in the same manner.

Dr. ATKINSON: It is asked what has this man done that is in advance of what has been known before. Probably this question cannot be replied to by any living man. Since 1856 I have been interested in the work, and have taken every opportunity to work from my stand what I could. I love the man as my own blood who is engaged in this work; I think it is a very holy fire that stimulates such persistence. My understanding is that it is the principle of interpretation that makes the differences. Although the things have been seen without interpretation by faithfully working men, they were not able to interpret what they saw. I have reference to the reticulate structure of the tooth substance: enamel, cementum, dentine, etc. Baccate fibres have been observed long ago and been attributed to the enamel; later discovery proved that the baccation was the transverse lines of the living fibres. It was Carl Heitzmann who discovered that the protoplasm was organized tissue and not homogeneous. With this we have struck ground where we can speak lovingly of the differences. There is one serious mistake of correct understanding in what Carl Heitzmann says, and one of the differences between him and me. If you listened closely, you will observe that Dr. Davenport said that Nasmyth's membrane which covered the enamel of the erupted tooth was connected with the epithelium of the gums; that is what the drawings of Dr. Carl Heitzmann show, but what nature never did show, never could show, never can show till the Divine Architect shall have changed the place of the development of the tooth. If I had time, I would make a drawing and show you the difference. I say it positively but lovingly that I may know a thing myself, but not know it for others. He who has learned sufficient of mental action to criticise the operations of his own mind through the increment of illumination, can criticise his own method with all the scaling severity of others. In the same manner, when we say two, we do not think the same sort of combination of units, and if we do not agree afterwards it is the misinterpretation of the individual. Dr. Heitzmann said in a modest manner at the time of the discovery of the structure of the cementum and dentine, that he was not ready to say they were nerve fibres, but they were a continuation of distinctly medullated fibers and came out as protoplasma-strings. I appeal to

all if that was not a justification of the illumination twenty-five years ago, that all embryonic tissue was a mass of what Heitzmann says is the living matter that does the movements of contraction and reflexion. Owen's Odontography gives a figure of the human tooth taken from the fœtus. The drawing shows the protoplasma fibres and the reticulated structure more than twenty-five years ago. They were called Max Schultze's forms, because he had seen them in certain conditions.— Nasmyth's membrane is the connective tissue-covering of the entire pulp of the tooth, and it is the last remnant of the membrana preformativa or enamel cap. It is outside the enamel cap, it goes down, and it is the base from which the cementum corpuscles have been evolved; it is the envelope of the completed tooth. Nasmyth's membrane is a sac perfectly closed upon the apex of the tooth.

Dr. DAVENPORT: I remember that Nasmyth's membrane in a specimen was really a very thin layer of cementum; they told us it was similar in construction. In the case of the bicuspids, there can be shown corpuscles similar to those in cementum proper.

Dr. ATKINSON: I have seen this. It is the basis from which the cementum comes; it is the embryonal state of the cementum. It is to the tooth what the amnotic membrane is to the fœtus.

Dr. DAVENPORT: The corpuscles of the membrane should be identical with those of the cementum, and not at all like those of epithelium.

Dr. ATKINSON: They are not! Then why should a histologist of Prof. Heitzmann's standing interpret epithelial corpuscles as bone corpuscles?

Dr. DAVENPORT: To me the membrane looked very similar to the margin of the gum as seen in the specimen.

Dr. ANDREWS: Nasmyth's membrane is the substance that forms a sheet over the enamel which it is almost impossible to destroy by the action of acids. It is the continuation of the organ which forms the cementum over the dentine; it is about $\frac{1}{2000}$ of an inch in thickness. When you pull it off the tooth it is full of holes; it looks like epithelial cells. It is under the most searching experiments a continuation of the cementum layer, because the corpuscles that are found in the deeper portion of it are found in the fissures. The corpuscles have been formed identical with the lacunæ in the dentine. Dr. Tomes says in his anatomy that he has seen specimens where there is no doubt about the fibrils between the enamel rods; he has demonstrated it to his own satisfaction. We have the three germinal layers: epiblast,

mesoblast and hypoblast; the first two are all you see in the embryo; it is what has been called cellular tissue but what we now call epithelial tissue; the innermost layer is columnar layer of the stratum Malpighii, and the connective tissue is below. If a tooth is to be formed, we find a ridge of epithelial tissue forming the dental groove; this grows longer and widens; the cells which multiply within the enamel organ are unlike the cells which we find in the epithelium. They are smaller, and appear entirely different. At this stage all is epithelial and possibly reticular; the ridge grows deeper and deeper, and finally parts from the upper layer of epithelium, and the dental cyst is formed from which the tooth afterwards originates.

(Three beautiful specimens of a tooth of a fœtus of a pig are shown, plainly showing this course of development.)

SECOND DAY—FRIDAY, JUNE 30, 1882.

MORNING SESSION.

President Fones in the chair.

A report of Dr. PARMELE from Section 4, on Surgical and Operative Dentistry, etc., is read; it was to the effect that his section had nothing to report.

Dr. LOVEJOY gave a report of two remarkable cases of teeth in the trachea.*

Dr. SHEPARD: On this subject I should wish to speak on the subject of separation of teeth for filling, and I would remark first, that the paucity of directions in the text-books is striking. Even Coleman in the new book has not very much. The text-books should have certain minute instructions as well as generalizations. I shall confine myself to slow wedging. I would like to say what I consider an *essential* for a material for separating teeth, and what I consider a *non-essential or desirable.* As essential, I consider:

First, Non-elastic or very slightly expanding substances should be used.

Second, They should have sufficient firmness of texture so as to prevent the play of the teeth and alternate movements.

Third, The space after obtaining it should be held firmly; the only movement should be one of separation.

Fourth, The increase of space should not be constant, but should have periods of movement and rest.

*The report will appear among our selections in a later number.

Fifth, The period of rest should be long enough—three to four days—to allow the teeth to recover from the soreness in the sockets, so that they can be operated on with as little pain as though they had not been moved.

Sixth, The substance should never press or touch the gums between the teeth.

Desirable: First, To devise a system of general adaptability combining the above essentials.

Second, To make such a system so simple to understand and easy to apply, that the patient can perform the service intelligently.

Third, To find a substance, agreeable to the patient in all respects possible.

These are my propositions or axioms. In examining them and the materials under this heading, I would remark that most materials, commonly used do not conform to these requirements, and the extracts from the books show that what they record does not conform with it. One of the materials that conform least is elastic rubber. I do not know to what extent rubber is and has been used in the years past by the majority of practitioners, but it is one of the materials which answer fewest of the essentials. It is elastic, has not sufficient body and firmness to prevent play; it does not answer to the third requirement that the space should be held firmly; there is no period of rest; it works constantly; if periods of rest are there they are only very short; the substance presses against the gums, etc. I go from the worst to the best. This is *tape* so saturated or charged with some substance as to render it of firmer texture, smoother on the surface and lubricated, a non-absorbent of odor or fluids, and so saturated with a material that putrefaction is arrested. The system is to some extent original, and I have worked it for three years and now present for the first time to the public. Plenty of other gentlemen have been using the tape, and it has been used at haphazard, but not by a system with such rules that you can give the patients a copy and let them come back with the teeth separated and free from soreness. (The little contrivance is here shown; it is a little box with a crutch rivetted on to keep the tape under the liquid, and at the end is an iron which strips the tape from an excess of liquid; the tape comes out beautifully smooth; it is simply hung on a piece of wood to cool and then wound up on a piece of board; the box contains nothing but wax. It can be put on the top of a vulcanizer when used). I use wax with a little glyzerol or thymol, on some tape with one per

cent., on others two per cent. Formerly the only way to wax the tape was to get it on a board and to rub the wax into it; I never have heard of other method of preparing tape. Now the system which I give for my patients includes several things: First, the initial force should be very slight; the second point is that the force should be gradually increased and the tape changed only once in twenty-four hours, to give a period of movement and a period of rest; the third rule is that the motion of going back should be arrested. Get what you can, keep what you got! The material should be left in until subsidence of soreness and recovery to such normal conditions that pressure and percussion should not produce pain. No portion of a tooth should be removed except for the best of the tooth itself; all space for working in difficultly accessible places should be obtained by moving the teeth and not by filing, unless this is done for the good of the tooth itself. My patients understand easily the use of this method. Another fact with my patients is, that the dread of separation of the teeth is a thing of the past. One thickness of the tape will go between any teeth unless there are sharp angles so as to cut it. You should not carry the tape too far up, but so that the pressure leaves a small width of tape above the point of nearest approach and below it. There is one other material I use besides tape, and this I do in the most trying cases under peculiar circumstances—in the case of teeth that touch close to the gums; it is vulcanized rubber. I make wedges and file them so that they will stay between the teeth; they are non-absorbent and remain perfectly sweet. I present these ideas to stimulate investigation in this line, and I intend to have the rules printed on a slip of paper and to give it to my patients.

Dr. MORGAN: White celluloid of piano keys is excellent for these wedges; it is smoother and finer than anything else.

Dr. SHEPARD: Several manufacturers have put into the market special wedge cutters. I do not see the necessity of any.

Dr. CUTTING: How would you hold the tape between the teeth and prevent it from going up to the gums where the teeth touch on the edges?

Dr. SHEPARD: That may be one of the cases where you have to make something of hard material, which your patients will take out during dinner and put back again afterward.

Dr. MORGAN: Fold the tape so that it will leave a seam inside which will work like a wedge and keep it from going up.

Dr. BLIVEN: I have used Dr. Shepard's method something like

five years, suggested by a patient who used it. She took a small piece of tape from the basket and pressed it between the teeth. I began to use and saturate it; I rubbed it on a board with wax, incorporating it thus; but that was not satisfactory, and I began passing it through hot melted wax, but I did not think that this was very good, and so I put it through a mixture of gutta-percha and wax, pressed it, and placed it on a board with paper over it, and put a hot flat-iron on it. I think that this will saturate more than any other method; it is a very quick and easy method.

Dr. MORGAN: In regard to tape, I do not know where I got the idea. I have used for several years cotton cloth—strips torn from the common cloth. I tear off strips and put them between the teeth. I was very much pleased with the method.

Dr. NOBLE: I think the use of tape is very valuable; I used it since 1853, but I never coated it this way. I think it would be a valuable addition to our supply. You know where you are with mathematical certainty.

Dr. COOLIDGE: I wish to give a suggestion in regard to the use of tape. I have found its use difficult where the teeth are slightly decayed. I made for myself a little spatula-blade one-half or one inch long, exceedingly thin—gradually tapering at the point—as thin as possible. Take the closest approximation between teeth you can find, and you can press the spatula between, and by giving lateral motion, there are very few cases between the bicuspids and molars where in a few minutes you cannot pass rubber or ligatures through. These spatulæ are made by Codman & Shurtleff.

Dr. SHEPARD: I would like to say a little personal remark in this connection. I spoke of one or two points as being original. The secret of the process seems to me to lie in a systematizing and formulating the methods, and this is what I did.

Dr. NOBLE: I will tell you what I once had in mind, but what I never did carry out. It is what may be called a dental catechism; for many patients it would be an advantage; they would remember better what is said to them.

Dr. ATKINSON: I would like to make a few remarks in regard to the success. I had the opinion about the meeting at Greenfield last year that it was the finest we ever had, as far as sociability and scientific attainments are concerned, but I am a little puzzled, for I think that this meeting has transcended the meeting at Greenfield, and we have had one of those meetings that tend to bind the hearts together in a

manner that adds to our strength in studying the intellectual problems that require more affection and interest to know the depth of science. The social element is really at the foundation of all improvements; however well we may work alone, it takes a long time to accomplish anything that benefits the world. We had the opportunity of visiting a place renowned for learning. It is a wonder to me how Dr. Vincent could crowd so much enjoyment and instruction in the time set apart for our visit. I want to move a hearty vote of thanks of this body to Dr. Vincent.

Dr. VINCENT: I think it is all out of the question; I have hardly tried to do anything.

Prof. MAYR: About three years ago, when I became first interested in dental questions, I was invited to attend a meeting of the Connecticut Valley Dental Association at Springfield. They told me that there will be Dr. Atkinson, a queer chap, with lots of Greek about himself. I was highly curious to make the acquaintance of the gentleman; I then thought him a trifle eccentric, but in possession of an immense amount of learning and a wealth of language that put me into difficulty, though I had experienced a fine drilling in Greek; during the last two years I have marked a decided change. Slowly Dr. Atkinson's ideas, like retrograde metamorphosis of tissues, his lectures about the structure of teeth, the value of direct observation, the worthlessness of relying more on text-books than observation, etc., are beginning to be understood, and we are in the happy danger to become as "queer" as Atkinson. I think that a very large percentage of the success in many of your meetings is and remains due to Dr. W. H. Atkinson.

Close of meeting.

THE CONNECTICUT VALLEY DENTAL SOCIETY.

The nineteenth annual meeting will occur Thursday and Friday, October 26 and 27, at the Massasoit House, Springfield, Mass. The first session will convene at 11 A. M., Thursday. The accommodations at this house are excellent, and the rates will be $2.50 and $3.00 per day. The reports from the Section Committees are, already, such as to warrant the promise of a most excellent meeting. Prominent gentlemen from New York, and elsewhere, have been invited, and are expected to be present. All dentists invited.

Per order of Executive Committee.

A. M. ROSS, *Secretary*, Chicopee, Mass.

EDITORIAL.

Dr. George Watt, after a venomous editorial—and after being a chemist of *forty* years' experience—plays the boy who, when his turn comes, "won't more play." We are sorry to think that Dr. Watt compares us with the journeyman and himself with the boy who was touched with the boot toe of the first one at his trowsers and afterwards said: "If I had known this, I wouldn't have learned the trade." We do not think that we were as uncivil as that, even in a figurative sense; but if we were, we will try no longer to be the journeyman, but the polite gentleman who treats a boy civilly, and even if he had only some forty years of chemical experience. We never raised the question of knowing any more about chemistry than a dentist. We know they all are too good chemists to compete with, they all have time, to spend from eight to ten hours daily in a chemical laboratory; we know they all have their analytical scales finely adjusted and have nothing to do but to investigate chemistry; we know that too well to claim that we, as a chemist, whose only business those things are, could know more than a dentist; but by a mere impulse of impudence we stepped among them like an innocent lamb among the wolves and, strange to say, we were never yet ejected for ignorance. But, we cannot be ironical; we have to try the plain fact style; we do not know to drop into the chemico-dental poetry of Dr. Watt, which flows like a train of cog-wheels of *forty* years' experience without greasing.—If a man has to write a good deal, he will write now and then a weak passage; not one man was excepted, from Moses and Plato and Paul, down to Mr. George Watt, and poor humble "Us, too." To take out such a sentence and put a misinterpretation into it, as Dr. Watt does now and then, is very easy—nothing easier—but this is not facing the point. Dr. Watt has not faced any of the *facts* mentioned in our August number, and fencing and beating about the bush with mere words, does not show very favorable for *forty* years of chemical experience. Our discussion did not touch the point of who knows more, but who is right. To misconstrue any of our words into claiming to be the only chemist among dentists, as Dr. Watt interprets them, does, to say the least, almost surpass unfairness. Every dentist with whom we have to deal will have to acknowledge that we suppose every man, without sufficient negative proof, to know as much as we do. We may be opinionated,

and stick too much to facts and to what we can prove, to suit some who practice the chemistry of words and forty *years'* experience. The question of decay seems to Dr. Watt to be settled once forever by his beautiful words about lactic, acetic acid and ammonia. Well, we do not care to rob him of a happy illusion, but we claim, at least, the right to investigate and test every word belonging to chemistry as far as it can be done. Then, Dr. Watt seems to be in another pious illusion, that the "chemistry of the oral cavity" is different from the organic and inorganic chemistry as generally known. To judge from his own results, after *forty* years' experience, we suspect it is an oral chemistry, or chemistry of words.

Dr. Watt says that "the discovery of caries as something else than an ulcer, laid the foundation of dental surgery." Now, sincerely, has the theory about caries anything to do with the excavating of a cavity and filling with gold, with extracting a painful tooth, with making proper separations, etc.? Have all the alkaline or acid washes or what supposed conditions in the supposition of Dr. Watt may require, ever prevented or cured an existing decay? If the acid and laboratory-theory has done that, we acknowledge ourselves beaten. No dentist, even if he be a chemist of forty years' experience, has ever *cured* a decay on the supposition of acids or alkali causing it. It may be that the object is not within the reach of our science at present, but we dare (!) to go ahead and not believe any man, if he has words only, without sufficient facts.

A trifle to the point, as if age had anything to do in giving a man chemical knowledge, discrimination between facts and fiction, applicability of facts to the question, etc. Modern chemistry, chiefly organic chemistry, is advancing so fast that the best man has to do all he can to keep up with the times. It was never better illustrated to us than by the fact that we almost had to regret to have received our first chemical instruction from J. v. Liebig. Liebig, the greatest chemist between 1840 and 1860, had not advanced beyond what he knew, discovered and reasoned; at the time of his death (1875), he still taught the old formulæ and theories, though already (1860) the views of Avogadro, Hofman and others threatened destruction to his views. He met them with disdain, in confidence of his superiority. Now J. v. Liebig was a master-mind; he ground out the best reasoning from the facts known to him; but even J. v. Liebig could not stop the world. Over his body the accumulation of facts and thoughts, called chemistry, advanced, and it was difficult for us

to throw off some of the shackles he fastened to us; Liebig may even have been up to the knowledge of a chemist of forty years' standing—whom Dr. Watt means I do not know, and therefore cannot offend, but he himself says to have studied and observed about that length of time. Dr. Watt himself continually cites Liebig, and by this alone shows that since 1860 he did not advance much. Many of the thoughts of Liebig are excellent; his negation of vital force laid the foundation of modern physiology; his reasoning, unbiased by theological myths, is clear, concise, and, as far as based on indisputable facts, good still to-day; but what he thought and wrote was the best *forty years ago*, and only the principles laid down by him—a reading of which Dr. Watt might find rather detrimental to his mythochemistry of dying and obedient molecules—have stood the test, while his detail-teaching has been superseded by better knowledge and interpretation of facts. We have met with dentists and chemists of forty years' experience who could not answer us the most simple questions, like:

What causes the hardness of teeth and why is decay soft?

Have you ever observed—not guessed!—any acetic or lactic acid in a decayed mass, decaying tooth, or in saliva, not due to their having been ingested a short time ago?

How do and did you determine and test lactic acid in a decayed mass or in the mixed fluids of the mouth, so that a chemist of less than forty years' experience may be able to do it also?

M. Piot has made experiments, under the direction of M. Laborde, to ascertain the order in which the functions of the organized tissues cease in normal asphyxia. He insists that the exact moment of death is very difficult to determine, and that we cannot fix the instant when the stoppage of the heart and of respiration is definite. The mechanical movements of inspiration first cease to become apparent; then the beating of the heart becomes less frequent, but continues; the pupils of the eyes are dilated excessively, and the cornea becomes insensible. These, however, are only apparent signs of death, for dogs, in which such phenomena have appeared, may still be brought back to life by means of artificial respiration.—*Pop. Science Monthly.*